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A Winning Essay

Polyethylene: A Plastic of Many Uses

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Look under your shampoo bottle and you will likely see the letters, "HDPE". Lift the lid of your reusable sandwich container and you might see "LDPE" on the lid's bottom. These abbreviations stand for "high density polyethylene" and "low density polyethylene", respectively, which are only two of the grades that polyethylene can be manufactured as. Polyethylene is an extremely versatile plastic with an illustrious history, although it is now a commonly found chemical in the home.

In 1933, E.W. Fawcett and R.O. Gibson of Imperial Chemical Industries in London accidentally discovered polyethylene when they reacted ethylene at extremely high pressures. The ethylene molecules linked together to form a polymer with the formula, $(\text{H}_2\text{C}:\text{CH}_2)_x$. After the reaction process was perfected, the first low density polyethylene plant was opened in 1939, just as World War II began. Polyethylene played a crucial role in the development of radar as it became the standard insulation in British radar cables because of its high electrical resistivity. After the war, polyethylene was available for recreational use such as being made into rings to fuel the Hula-Hoop craze of the 1950's. Thinking more practically, Earl Tupper invented Tupperware, polyethylene containers with airtight lids.

In 1953, Karl Ziegler of Germany, discovered a way to produce polyethylene at atmospheric pressure using special aluminum catalysts. This discovery had the double benefit of bringing down the required pressure for reaction and producing a less branched and therefore more crystalline polymer, high-density polyethylene. While both LDPE and HDPE are white,

translucent, waxy textured thermoplastics with excellent resistance to water, chemicals, and electricity, HDPE is much more rigid and resistant to heat and surfactants. These qualities of HDPE make it useful for shampoo, detergent, and bleach bottles. However, LDPE is cheaper so it is used extensively in products such as packaging film, squeeze bottles, toys, and ink tubes for pens. Other diverse uses for polyethylene include cold water pipes, vapour barriers in buildings, insulation, flexible foam, artificial hip joints, and household items such as laundry baskets and water buckets. Because polyethylene is non-toxic, it is used in squeeze bottles for condiments, as food wrap, and as a base component of chewing gum. Over the years, other grades of polyethylene have been discovered and put to use. Linear low-density polyethylene shows up in "new and improved" garbage bags while cross-linked polyethylene is widely used as power cable insulation.

Although the raw material for polyethylene comes from coal, a non-renewable resource, polyethylene is environmentally friendly since polyethylene products are durable and recyclable. As well, polyethylene film is used in Tetra Brik cartons which reduce waste. The development of polyethylene has often been credited with initiating the modern plastics industry. Many newer plastics such as polypropylene, polystyrene, and Teflon, are variations of polyethylene. However, the reliability, relative cheapness, and versatility of polyethylene ensure its continued use in the future.

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